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ABSTRACT

Human resources and information technologies are two of the most important cornerstones in the government's development policy in Singapore. This study investigated the process by which university teachers arrived at the positive perception of computer-assisted instruction (CAI). The CAI survey was distributed to 118 randomly selected (education and business) teachers at one of two leading universities in Singapore; 63 teachers (53%) responded. This study revealed that the knowledge of CAI was a dominant factor influencing the perceived usefulness of CAI after all: the higher the CAI knowledge level is, the higher the positive perception of CAI will be. This finding may be an indication of the Singapore's favorable climate for instructional technology use for school and university teachers, yet the world's educational communities should take note of it. (Author)

University Teachers' Perceived Usefulness of Computer-Assisted Instruction

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Abstract

Human resources and information technologies are two of the most important cornerstones in the government's developmental policy in Singapore. This study investigated the process by which university teachers arrived at the positive perception of computer-assisted instruction (CAI). The CAI survey was distributed to 118 randomly selected (education and business) teachers at one of two leading universities in Singapore; 63 teachers (53%) responded. This study revealed that the knowledge of CAI was a dominant factor influencing the perceived usefulness of CAI after all: The higher the CAI knowledge level is, the higher the positive perception of CAI will be. This finding may be an indication of the Singapore's favorable climate for instructional technology use for school and university teachers, yet the world's educational communities should take note of it.

University Teachers' Perceived Usefulness of Computer-Assisted Instruction

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Computer-assisted instruction (CAI) is not a new approach. Computers have been utilized in instructional settings since the late 1950s. Interactive educational materials, as noted by Sheldon (1995), began to evolve as soon as microcomputers became available from Apple, Commodore, and Tandy in 1977; in particular, since the IBM-PC was introduced in 1981, personal computers have developed into powerful and inexpensive machines capable of multimedia presentations using graphics, animation, audio, and interactive video. As computers have become smaller, more powerful, and more cost-effective, their use in educational settings has increased rapidly. CAI is currently being used to teach students and to train teachers as well. The field of CAI covers all kinds of instructional systems in which computers are used to support teaching and learning. If properly designed and implemented, CAI has many advantages: CAI offers an interactive response, immediate feedback, infinite patience, motivation, and an ability to maintain accurate records of student progress (Sloane, Gordon, Gunn, & Mickelsen, 1989).

In this modern and technological age, CAI will be a powerful complement to traditional teaching methods. Teachers can help keep students' interest by using CAI to provide a variety of instructional methods and presentations in the class. For the past three decades, however, CAI has made only minor progress in the classroom implementation. Why? In Marcinkiewicz's (1993-94) words, one of the major reasons is that many teachers are reluctant to adopt CAI, even though they strongly believe that using computers can improve the quality and quantity of their teaching. In this regard, Marcinkiewicz has likened the situation to corn farmers who do not uniformly adopt a new corn seed that can improve the amount and

quality of their yields. That is to say, like any other technological innovations when used for teaching purposes, CAI needs to be accepted by teachers before it can be utilized productively as well as effectively (Mackowiak, 1990-91).

Selecting Singapore as a Site for the Survey

The Republic of Singapore is such a small country (2.7 million people) and almost the entire educational system is public and is subject to centralized planning and the control of government agencies. According to A Vision of an Intelligent Island: The IT2000 Report (NCB, 1992), over half of Singapore's teachers will have received intensive training in instructional technology by the year 2000. Human resources and information technologies (IT) are two of the most important cornerstones in the government's developmental policy. If everything goes well as planned, Singapore (the "intelligent island") will be one of the first countries in the world (probably the first one) to have the national information infrastructure capable of connecting computers in every home to office, school, or factory (Sponder & Hilgenfeld, 1993). Singapore is interested in IT for many reasons (e.g., teacher shortage, school attrition, and quality teaching, in addition to the recognition of the importance of general education). A project called the "Student-Teacher Workbench" (STW) is part of the government's IT2000 plan to exploit IT for competitive advantages (Hu & Hoon, 1994). STW is a one-stop electronic shop which allows teachers and students at elementary and secondary schools to gain access to a wide range of information, reference documents, and self-study materials. It is also a tool to communicate with others located in different parts of the world. CAI will be used in STW for enhancing self-learning at school and from a distance.

Extensive experiments on the STW implementation, mainly with respect to secondary and higher education, are now being conducted by the National Computer Board (NCB) and by the National Institute of Education (NIE). NIE is the

sole college of education in Singapore. The Instructional Science Division of NIE is involved in the ongoing development of programs and methods to improve the teaching and learning process, primarily through the use of educational technology (Sponder & Hilgenfeld, 1993). To prepare teachers to cope with advances in IT, NIE established IT courses in 1986. Teachers are learning how to use computerized data-banks, to extract materials from various electronic sources, and to use multimedia to create lessons by mixing words, pictures, and sounds. Pre-service teachers are required to take the thirty-hour IT course. Software developments for CAI are now being conducted at Nanyang Technological University (NTU), the National University of Singapore (NUS), and four Polytechnic institutions.

In Singapore, of course, the use of CAI is not new. In 1986, twenty-two networked computer programs were started in a secondary school (Barker, 1988; Yip & Sim, 1990). The mission of the programs was to evaluate CAI functions (i.e., tutoring, simulation, and problem-solving) and to examine the effectiveness of the network of the CAI delivery mechanism. Published studies on the effect of CAI in Singapore's schools have shown positive results in such courses as Mathematics (Ong & Lee-Leck, 1986), Geography (Low, 1988), and Geometry (Woo-Tan, 1989). Effect s of CAI have been studied in many ways, yet little attention has been given to a fundamental issue, namely, how Singapore's university teachers feel about using CAI for teaching. It is viewed that faculty members generally have positive perceptions of CAI (Kluever, Lam, Hoffman, Green, & Swearingen, 1994). Such perceptions must have been cultivated by the belief that computers are necessary and useful for teaching (and faculty development) in technologically sophisticated societies of today. It is thus relevant to investigate which factors are significantly associated with the university teacher's perceived usefulness of CAI, in particular, in the Singapore's favorable academic climate for instructional technology.

Method

The Path-Analytic Model

The factors influencing the university teacher's perception of CAI were theorized in the path-analytic model. The model evaluated the factors for the teacher's perception of CAI as a function of his or her background characteristics, teaching experience, and knowledge of CAI. Although each variable in the model (see Table 1 for the definitions of operational variables) was hypothesized to influence the perception of CAI, the manner in which this influence was exerted was expected to differ. Figure 1 depicts the structure of the model, navigating the hypothesized process by which the teacher perceives the usefulness of CAI. Each of the straight lines within the model represents the hypothesized direct influence of one variable on another with the arrow indicating the direction of influence. The curved line within the model represents that two variables are related but no causal relationship is hypothesized between them.

Variables

The first block of variables in the model comprises exogenous variables which represent the teacher's gender, age, and teaching discipline (education versus business). While research has shown a significant difference between males and females in their attitudes toward teaching with computers (e.g., Kirk 1992), research has also shown the opposite result (e.g., Juska & Paris, 1993). In fact, there are few substantive empirical data on how male and female teachers differ regarding instructional technology. Young people are generally expected to favor CAI, but this may not be the case in technological-oriented countries such as Singapore. Singapore's faculty members are fairly young (mandatory retirement age is 55), and the government is supportive for the widespread availability of computers at schools and universities. As regards teaching discipline, it is viewed that business

faculty members are technology-oriented, whereas education faculty members are behavior-oriented.

Subsequent variables in the model are endogenous, that is, dependent on prior variables. The model also specifies no causal relationships between variables within the same block. The second block of variable is the teacher's highest academic degree. This variable came from Singapore's CAI experts, who strongly suggested that academic degree might be interesting to investigate how it would be related to the perception of computerized technologies such as CAI. Faculty members with higher academic degrees are usually tenured; thus they may be less afraid of losing their jobs because of the involvement in CAI or any innovative "teaching machines."

The third block of variables in the model considers the teacher's teaching experience (the number of years in teaching) and knowledge of CAI. The curriculum reform [including teaching with technology] is a site of on-going negotiation and contestation among university teachers (Tierney, 1995). Many educational innovations have failed because they have never been adopted into traditional instructions (Dynan, 1984). Perhaps teachers' resistance to change is the constraining factor for the use of CAI (Plomp, Pelgrum, & Steerneman, 1990). Adopting an innovative curriculum by utilizing instructional technology may be related to teaching experience and knowledge of CAI. In short, the more the teachers have the knowledge of CAI, according to Smith and Yellen (1991), the more they perceive CAI as useful for teaching.

The fourth block of variable in the model considers whether or not the university teacher is currently using CAI for teaching. Dupagne and Krendl (1992) found that users of CAI perceived the usefulness of CAI as significantly greater than did non-users. Singapore may be different from other cases, however, mainly

because of the constant publicity given to the importance of instructional technology advertised through media daily. The last variable in the model represents the university teacher's perception of CAI.

In summary, it was hypothesized that the perception of CAI would be largely influenced by the current use of CAI which, in turn, would be largely influenced by both teaching experience and knowledge of CAI. The perception of CAI was also thought to be influenced directly by knowledge of CAI. Teaching experience and knowledge of CAI were basically conceptualized to be associated with academic degree, which would be greatly influenced by age, gender, and teaching discipline.

Table 1

Definitions of Operational Variables

Variable	Definition
1. Gender	The teacher's gender. Nominal scale: 1 = Male, 2 = Female.
2. Age	The teacher's age (in years) with three categories: 1 = 30 or less; 2 = 31 to 45; 3 = 46 or over.
3. Teaching Discipline	Business versus education. Nominal scale: 1 = Business; 2 = Education.
4. Academic Degree	The teacher's highest academic degree with three classifications: 1 = Doctorate; 2 = Master; 3 = Bachelor or Associate.
5. Knowledge of CAI	The teacher's CAI knowledge with five levels: 1 = know nothing about CAI; 2 = know a little about CAI; 3 = have read about CAI but have never experienced it; 4 = have seen demonstrations of CAI developed by others; 5 = have developed CAI myself.
6. Teaching Experience	The teacher's teaching experience at colleges or universities (in years) with four categories: 1 = 5 or less; 2 = 6 to 15; 3 = 16 to 25; 4 = 26 or more.
7. User or Non-User of CAI	The teacher is using or not using CAI for teaching. Nominal scale: 1 = user of CAI; 2 = non-user of CAI.
8. Perception of CAI	The teacher's perceived usefulness of CAI with five categories. Recoded to 5-point Likert Scale: 5 = extremely useful; 4 = very useful; 3 = useful; 2 = somewhat useful; 1 = not useful at all.

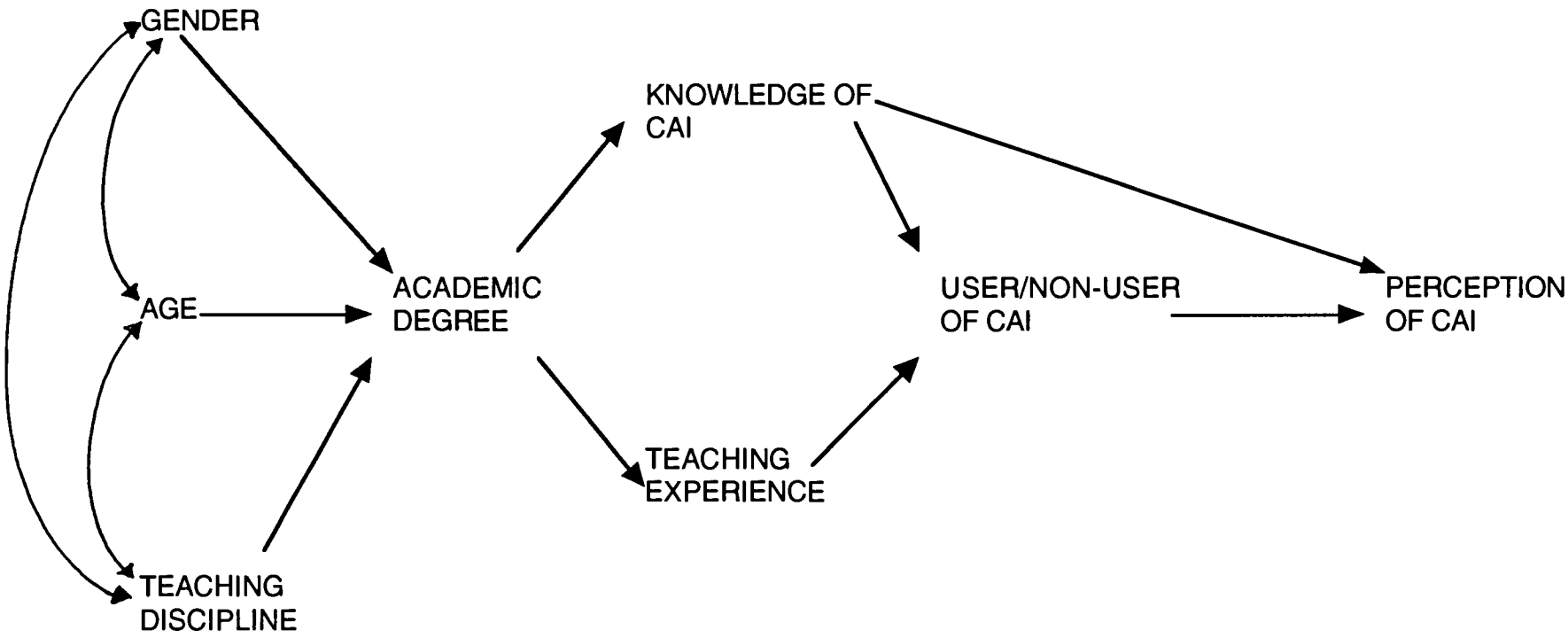

Figure 1

The Theoretical Model of University Teachers' Perceived Usefulness of CAI

Participants

Participants for this study were drawn from two of the entities at Nanyang Technological University (NTU), which is one of two leading universities in Singapore: (1) The division of Education, which is part of the National Institute of Education (NIE), and (2) the Nanyang Business School (NBS). The target population of the study was all the teachers from these two entities at NTU. The division of Education had 59 teachers (60% female; 40% male) and NBS had 208 teachers (25% female; 75% male). All the teachers of the division of Education received a copy of the survey questionnaire. In order to match the sample size of NIE, 59 teachers of NBS were randomly selected to participate in the survey. Of the 118 participants, 63 (53%) responded; accordingly, the study reported here was based on the data from those 63 respondents representing the two groups: 27 were from education and 36 were from business.

Procedure

The preliminary survey questionnaire (consisting of determinants for the use of CAI, perceptions of CAI, open-ended comments on CAI, and demographic information) was pilot-tested through personal interviews with four teachers at NTU (two users and two non-users of CAI). Based on their comments and suggestions, the final version of the survey questionnaire was constructed. The primary issue of the survey was to identity the relative importance of facilitators and inhibitors for the use of CAI by university teachers. The secondary issue was exploratory, aiming to identity the significant relationships between the variables and the teachers' perceived usefulness of CAI. Only the results of the secondary issue were reported in this paper.

One faculty from each entity agreed to serve as a contact person for the survey. The two contact persons received a packet containing an explanatory letter,

directions for administering the survey, and 59 copies of the questionnaire. The survey was conducted with the dean's permission of each school at NTU. Each contact person distributed, collected, and returned all questionnaires to the researcher. Table 2 presents the detailed demographic information of the study participants. In addition, as seen in Table 3, the participants show positive perceptions of CAI.

Table 2

Demographic characteristics of all the respondents

		Education $N = 27$	Business $N = 36$	Total $N = 63$
Gender:				
	Male	11	25	36(57%)
	Female	16	11	27(43%)
Age (in years):				
	30 or less	4	3	7(11%)
	31 - 45	10	23	33(52%)
	46 or over	13	10	23(37%)
Highest academic degree:				
	Doctorate	23	24	47(75%)
	Master	4	11	15(24%)
	Bachelor	0	1	1(1%)
Users versus non-users of CAI:				
	User	10	17	27(43%)
	Non-user	17	19	36(57%)
College teaching (in years):				
	5 or less	7	16	23(37%)
	6 - 15	13	16	29(46%)
	16 or more	7	4	11(17%)

Table 3

The Study Participants' Perceptions of CAI

Extremely useful	12
Very useful	21
Useful	23
Somewhat useful	6
Not useful at all	1
Total	63

Analysis

Path analysis (a research method for presenting a causal model in which a series of independent variables is used to predict a series of dependent variables) was used in this study to estimate the influences on the perception of CAI. The model was estimated with ordinary least-squares procedures using a computer program called GEMINI by Wolfle and Ethington (1985). This program computes indirect effects and their standard errors in addition to the usual regression results. All paths were estimated to test whether the paths hypothesized to be zero were nonsignificant. Direct effects are represented by regression coefficients, either standardized (beta weights) or unstandardized (b weights), interpreting in the usual manner. Indirect effects (the sums of the products from the direct effects through intervening variables in the model) represent the influences on the dependent variable, which is the results of directly influencing prior causal variables in the model. And direct and indirect effects implied by the model were estimated from means, standard deviations, and correlations (see Table 4) among all the variables in the model.

Table 4

Means, Standard Deviations, and Correlations for Variables in the Model of University Teachers' Perceived Usefulness of CAI ($N = 63$)

	1	2	3	4	5	6	7	8
1. Gender	--							
2. Age	.007	--						
3. Disciple	.287	.157	--					
4. Degree	.115	-.068	-.220	--				
5. Knowledge	-.053	-.064	.053	-.015	--			
6. Experience	-.224	.463	.223	.003	.173	--		
7. User/non-user	.102	.143	.102	.019	-.426	.013	--	
8. Perception	-.015	.102	.088	-.025	.393	.035	-.225	--
Mean	1.429	2.254	1.429	1.270	3.444	10.190	1.571	3.571
SD	.499	.647	.499	.482	1.215	7.971	.499	.949

Results

The estimated coefficients of the five equations defining the path model described above are given in both standardized and metric (unstandardized) forms in Table 5. The last column of the table indicates the direct effects of each variable in the model on the perception of CAI. In addition to the direct effects, the table shows that the seven variables in the model explain 19.60 % ($R^2 = 0.196$, $p < .05$) of the variance in the perception of CAI. Figure 2 illustrates diagrammatically the significant direct effects represented in Table 5.

Table 5
Direct Effects on University Teachers' Perceived Usefulness of CAI[a]

Variables	Dependent Variables 4	5	6	7	8
1. Gender	.193 (.186)	-.079 (-.193)	-.321* (-5.131)	.057 (.057)	-.054 (-.103)
2. Age	-.027 (-.020)	-.077 (-.145)	.430* (5.307)	.084 (.065)	-.199 (-.292)
3. Teaching Discipline	-.277* (-.262)	.090 (.218)	.276* (4.411)	.093 (.093)	.102 (.194)
4. Academic Degree		.009 (.022)	.130 (2.150)	. 032 (.033)	.025 (.050)
5. Knowledge of CAI				-.429* (-.176)	.386* (.301)
6. Teaching Experience				.040 (.003)	-.158 (-.019)
7. User or Non-User of CAI					-.092 (-.176)
8. Perception of CAI					
R^2	.084	.333	.014	.211	.196

[a]Metric (unstandardized) coefficients are given in parentheses.
*$p < .05$.

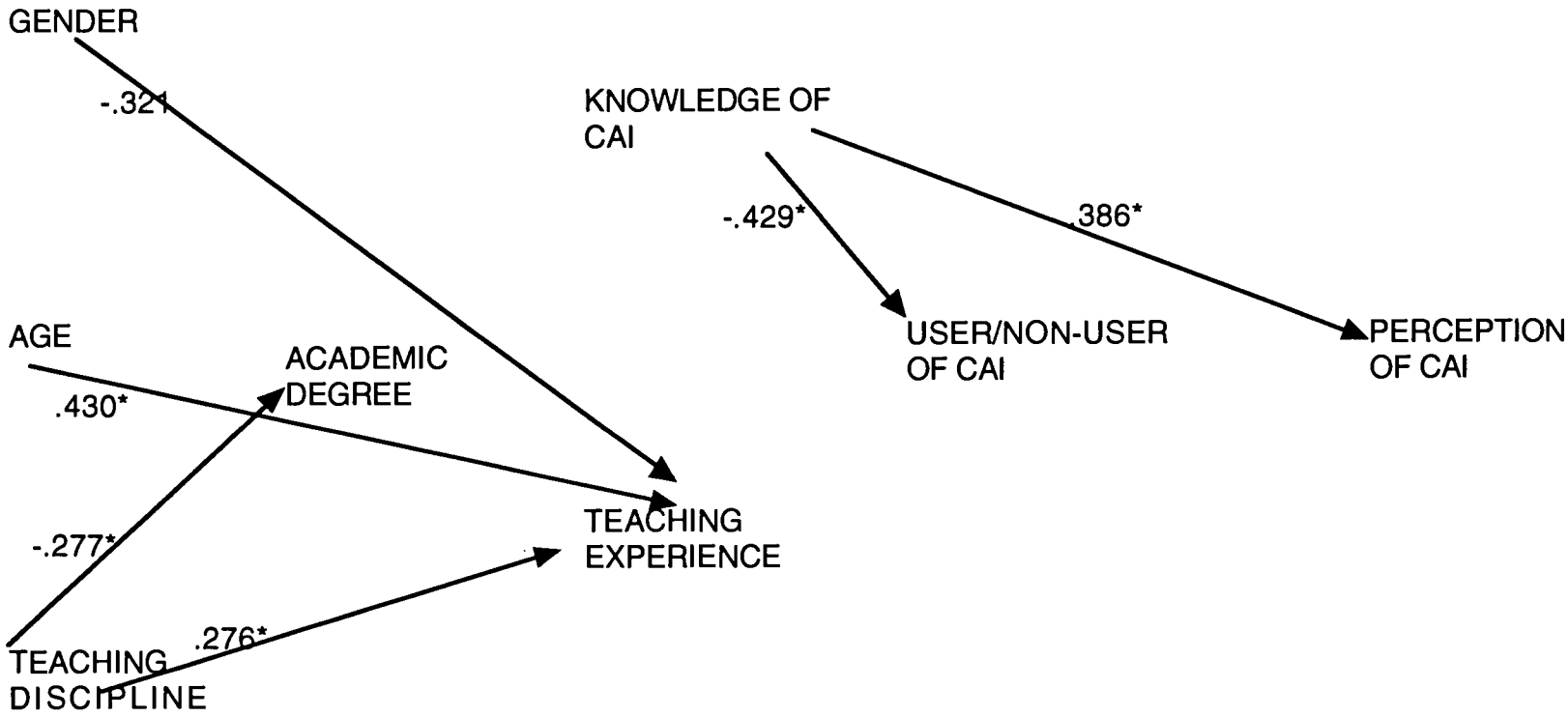

Figure 2

The Estimated Model of University Teachers' Perceived Usefulness of CAI

* $p < .05$

Direct Effects

Academic Degree. Teaching discipline (beta = -.277) was the only one that had significant direct effect on academic degree for this sample of teachers. The negative effect indicates that teachers in business are less likely than teachers in education to have higher academic degrees.

Knowledge of CAI and Teaching Experience. Contrary to the hypothesized model, academic degree had no direct influence both on knowledge of CAI and on teaching experience. Instead, all three exogenous variables indicated significant direct effects on teaching experience in the following order of magnitude: age (beta = .430), gender (beta = -.321), and teaching discipline (beta = .276). Perhaps it is a matter of course that age is the most influential effect on teaching experience. The negative effect in gender reveals that female teachers are more likely than male teaches to have fewer years of teaching experience in college and university levels.

User Versus Non-User of CAI. Although the theoretical model posited that the dominant influence on user or non-user of CAI should come from both knowledge of CAI and teaching experience, knowledge of CAI (beta = -.429) was the only variable that indicated a significant direct effect as to whether the teacher was using CAI or not. The strong negative effect explains that the teacher who is a current user of CAI is more likely to have knowledge of CAI than is the teacher who is a non-user. Surprisingly, however, teaching experience as defined by the number of years in teaching shows a nonsignificant direct effect on user versus non-user of CAI.

Perceived Usefulness of CAI. As hypothesized by the theoretical model, the direct influence on the perceived usefulness of CAI was knowledge of CAI (beta = .386). The theoretical model posited that dominant influences should come from two variables (i.e., knowledge of CAI and user versus non-user of CAI).

Nevertheless, user versus non-user of CAI had no significant direct influence on the perception of CAI. Knowledge of CAI was the only variable influencing the perception of CAI and its effect is fairly strong, supporting the finding of other studies (e.g., Smith & Yellen, 1991; Spotts & Bowman, 1993). The higher the knowledge of CAI is, the higher the positive perception of CAI will be; anyway, the importance of the knowledge of CAI cannot be underestimated.

Indirect Effects

Table 6 presents the indirect effects of the variables in the model on the perception of CAI. None of variables have significant indirect effects because for this sample of teachers there is no significant direct path (1) from academic degree to knowledge of CAI, (2) from academic degree to teaching experience, (3) from teaching experience to user versus non-user of CAI, and (4) from user versus non-user of CAI to perception of CAI, respectively.

Table 6

Indirect Effects on University Teachers' Perceived Usefulness of CAI[a]

	Standardized	Metric (unstandardized)
Gender	.014	(.026)
Age	-.110	(-.162)
Teaching discipline	-.016	(-.031)
Academic degree	-.020	(-.040)
Knowledge of CAI	.040	(.031)
Teaching experience	-.004	(-.0004)

[a]None of variables are significant.

Open-Ended Comments on CAI

The study respondents' general comments on the use of CAI include:

(1) University teachers need to underpin the use of CAI with higher levels of teaching skills than they generally have.

(2) CAI must be greatly improved as an instructional tool in higher education.

(3) CAI is not a solution for all the university courses and therefore promoting the CAI implementation by using a top-down approach should be avoided.

(4) CAI may be suitable for practical studies more than for theoretical studies.

(5) CAI is very important since it can enhance students' critical and analytical thinking.

(6) The fact that older students with less computer experience makes the CAI implementation more difficult in the college of education.

Summary and Conclusion

The results of this study punctuated that the knowledge of CAI is a dominant factor influencing the perceived usefulness of CAI for this sample of university teachers, with no statistically significant effects coming from age, gender, and teaching discipline. This finding may be an indication of the Singapore's favorable climate for instructional technology use. The fact that the higher the CAI knowledge level is, the higher CAI is perceived to be useful is not surprising at all. One implication of this finding is that if an academic institution wants its teachers to utilize CAI, it should increase the whole teachers' knowledge level of educational technology. This is exactly what the Ministry of Education in Singapore is doing by requiring school and university teachers to learn about computer skills in general and CAI skills in particular. The second factor which is identified as influencing the perception of CAI is the self-categorization of the teacher as being a user or non-user of CAI. Indeed, the teacher who is using CAI perceives the usefulness of CAI significantly greater than does the teacher who is not using. This finding is also not particularly surprising and is consistent with the finding of Dupagne and Krendl (1992).

Although further exploration is necessary to examine the impact of the university teacher's perception on the use of CAI, the above-mentioned findings can

be treated with more confidence and used by both the School of Business and the College of Education at NTU for educational planning purposes. In this technological age, the integration of CAI with conventional instructions is one alternative approach of teaching in higher education. Countries like Singapore are making major investments in the information superhighway toward the twenty-first century. The Singapore government's objective is to increase the use of instructional technologies such as CAI. The results of this study may be attributed to the Singapore's unique climate for instructional technology use, yet the world's educational communities should take note of these findings.

It is important to note, however, that comparing user and non-users of CAI was very important in this study, and it was necessary to ask the participants to indicate which category they belonged to. Talisayon (1990) described three computer uses: (1) as a learning tool, (2) as itself the object of study, and (3) as a planning and management tool. Also, the term "the use of CAI" or "computer use" has broad definitions and each participant may have had a different definition in mind. It was not clear to what extent the participants used CAI when reporting their CAI use.

Finally, CAI is not suitable for all the university courses. As stated before, the integration of CAI with traditional teaching methods would be better in higher education. It should be noted, however, that the twenty-first century students must master sophisticated information age learning media (i.e., tool software such as graphics, database, spreadsheet, multimedia, and Internet) and must become accountable for demonstrating learning more directly than did students of the past. Should teaching with CAI prove to be effective in improving university teaching. Eventually, the option mix of CAI and conventional instructions is an intriguing topic for research.

REFERENCES

Barker, P. (1988). Computer assisted learning in Singapore. British Journal of Educational Technology, 19(3), 193-201.

Dupagne, M., & Krendl, K. (1992). Teachers' attitudes toward computers: A review of the literature. Journal of Research on Computing in Education, 24(3), 420-429.

Dynan, M. B. (1984). Evaluation of implementation of curriculum innovations. In Ryan, A. S., & Fraser, B. J. (Eds.). Educational Evaluation for Program Improvement.

Hu, R., & Hoon, P. M. (1994). Student's and teacher's workbench. Information Technology - Journal of the Singapore Computer Society, 6(1), 91-96.

Juska, A., & Paris, A. E. (1993). Students computer use: Its organizational structure and institutional support. COLLEGIATE MICROCOMPUTER, 11(2), 42-50.

Kirk, D. (1992, April). Gender issues in information technology as found in schools: Authentic/synthetic/fantastic? Educational Technology, pp. 28-31.

Kluever, R. C., Lam, T. C. M., Hoffman, E. R., Green, K. E., & Swearingen, D. L. (1994). The computer attitude scale: Assessing changes in teachers' attitudes toward computers. Journal of Educational Computing Research, 11(3), 251-261.

Low, K. G. (1988). Investigation of various modes of computer-based learning for secondary schools. Singapore Journal of Education, 9(2), 27-32.

Mackowiak, K. (1990-1991). The effects of faculty characteristics on computer applications in instruction. Journal of Research on Computing in education, 23(3), 396-410.

Marcinkiewicz, H. R. (1993-1994). Computer and teachers: Factors influencing computer use in the classroom. Journal of Research on Computing in Education, 26(2), 220-237.

National Computer Board [NCB]. (1992). A vision of an intelligent island: The IT2000. Singapore: Singapore National Printers.

Plomp, T., Pelgrum, W. J., & Steerneman, H. M. (1990). Influence of computer use on schools' curriculum: Limited integration. Computer Educ., 14(2), 159-171.

Ong, S. T., & Lee-Leck M. K. (1986). The effects of computer-assisted instruction on attitudes and achievement in mathematics on preserves primary school teachers. In Yong, Y.C., Loy, W. S., & Lee, C. K. (Eds.). Selected proceedings of Educomp'86: Impact of Microcomputers in education - issues and techniques. (pp. 196-201). Singapore: Ngee Ann Polytechnic.

Sheldon, E. J. (1995). CAI/Multimedia approach to farm tractor and machinery safety certification. Unpublished Doctor's Dissertation. Purdue University, Indiana.

Sloane, H. N., Gordon, H. M., Gunn, C., & Mickelsen, V. G. (1989). Evaluating educational software: A guide for teachers. Englewood Cliffs, NJ: Prentice Hall.

Spotts, T. H., & Bowman, M. A. (1993). Increasing faculty use of instructional technology: Barriers and Incentives. Educational Media International [EMI], 30(4), 199-204.

Sponder, B., & Hilgenfeld, R. M. (1993). Research in instructional technology at the National Institute of Education, Singapore. ETR&D, 41(4), 115-118.

Smith, T. W. , & Yellen, R. E. (1991). Factors inhibiting the introduction of computer-assisted instruction. COLLEGIATE MICROCOMPUTER, 9(2), 117-122.

Talisayon, V. M. (1990). Preparing ASEAN for the information century: A comparative study of policies and programs on computes in science and mathematics education. University of the Philippines Press.

Tierney, W. (1995). Cultural politics and the curriculum in postsecondary education. In Conrad, C. F., & Haworth, J. G. (Eds.) Revisioning curriculum in higher education (ASHE reader series). (pp. 35-47). Simon & Schuster.

Wolfle, L .M., & Ethington, C.A. (1985). GEMINI: Program for analysis of structural equations with standard errors of indirect effects. Behavior Research Methods, Instrument, and Computers, 17(5), 581-584.

Woo-Tan, L. B. (1989). Effects of computer-assisted instruction on the learning of transformation geometry. Unpublished Master's Dissertation. National University of Singapore.

Yip, S. K., & Sim, W. K. (1990). Evolution of educational excellence: 25 years of education in the Republic of Singapore. Singapore: Longman Singapore.

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